REMARKS

I. STATUS OF THE CLAIMS

Claims 21-38 and 42-52 are pending in this application. Claims 21, 31-33, and 47-52 have been amended to more particularly point out and distinctly claim the present invention. Specifically, the claims, as well as page 4 of the specification, have been amended to recite that the presently claimed compositions comprise, among other things, at least one branched sulfonic adhesive polymer <u>having a Brookfield thermosel viscosity at 177°C of about 35,000 cP (mPa·s)</u>. The amendments are supported by the originally filed specification, e.g., at page 4, and the examples, which all refer to the Eastman polymer AQ 1350. As described in greater detail below, the Eastman polymer AQ 1350 is known, and was known at the time of the filing of the present application, to have certain properties including the Brookfield viscosity now claimed. Accordingly, no new matter has been added by these amendments, nor do these amendments raise new issues or necessitate the undertaking of any additional search of the art by the Examiner. Instead, the amendments and remarks submitted herewith are intended to supplement and clarify several telephonic discussions held with the Examiner during the last few months.

II. REJECTION UNDER 35 U.S.C. § 112, FIRST PARAGRAPH

Claims 21-38 and 42-52 stand rejected under 35 U.S.C. § 112, first paragraph, for allegedly containing new subject matter, "which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention." Final Office Action at 2. Specifically, the Examiner contends that there is no

support in the specification for the expression "branched sulfonic" adhesive polymer. Her position is that there is support in the specification only for one polymer, namely Eastman AQ 1350, and that recitation of the genus within which it falls (branched sulfonic adhesive polymers) is not supported.

Although Applicants respectfully disagree with the Examiner, they have further amended the claims herein to recite that the adhesive polymer is a branched sulfonic adhesive polymer having a Brookfield thermosel viscosity at 177°C of about 35,000 cP (mPa·s). As previously discussed with the Examiner on the phone, even though the Examiner is effectively requesting Applicants to limit their claims to recite only AQ 1350 as the adhesive polymer, Applicants cannot amend the claims to recite the AQ 1350 polymer per se because (1) the trade name of a compound cannot be claimed, and (2) Eastman has not made the structure or chemical name of this polymer publicly available. However, using a number of Eastman's publicly available brochures about its AQ polymers as guidance, the claims as amended now reflect several physical parameters that one skilled in the art would recognize as specifically defining the AQ 1350 polymer, namely, that it is adhesive, branched, sulfonic, and has a Brookfield thermosel viscosity at 177°C of about 35,000 cP (mPa·s). The specification has also been amended to reflect this viscosity.

Despite the clear support for these amendments on the record, the Examiner refused to enter the Amendment after Final, contending that the Amendment "raises issue under new matter." Advisory Action at 2. Specifically, in response to the three Eastman brochures discussing AQ 1350 that were referenced in the Amendment, the Examiner asserts that the "Eastman brochure[s] submitted on 8/24/06 and 5/25/05 to

describe the AQ 1350 polymer sold by Eastman company is after the filing date of the specification." *Id.*

Accordingly, Applicants now submit the paper entitled "Water-Dispersible Adhesive Raw Materials for Non-Woven Assemblies," written by Richard A. Miller of Eastman Chemical Company. This paper bears a 1997 date in its filepath, and 1997 is clearly before the filing of the present specification.

At this point, Applicants have presented ample evidence that the present amendment results in the claiming of the specific properties of the AQ 1350 polymer in the pending claims.

Applicants again remind the Examiner that U.S. PTO rules preclude Applicants from claiming AQ 1350 by its trade name, and that, as discussed on the record, the chemical name of AQ 1350 has not been made publicly available by its manufacturer. Thus, in light of the present amendment, combined with the disclosure of AQ 1350 in the originally filed specification, there is no doubt that the parameters of AQ 1350 which are now claimed "reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention." The amendments to the specification and claims are thus fully supported under 35 U.S.C. §112 and accordingly should be entered and the claims allowed.

III. CONCLUSION

In view of the foregoing amendments and remarks, Applicants respectfully request the reconsideration of this application and the timely allowance of the pending claims.

If the Examiner believes a telephone conference could be useful in resolving any of the outstanding issues, she is respectfully urged to contact Applicants' undersigned counsel at 202-408-4454.

Please grant any extensions of time required to enter this response and charge any additional required fees to our Deposit Account No. 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

Thalia V. Warnement, Reg No. 39,064

Dated: November 21, 2006

By: for Deborah M. Herzfeld
Deborah M. Herzfeld
Reg. No. 52,211

Attachment: Paper dated 1997 and entitled "Water-Dispersible Adhesive Raw Materials for Non-Woven Assemblies"

Water-Dispersible Adhesive Raw Materials For Non-Woven Assemblies

Richard A. Miller
Eastman Chemical Company

Abstract

Bonding with holt-melt adhesives poses some unique requirements to maintain bond integrity under a variety of end uses. The hot-melt adhesive industry has desired a water-dispersible raw material for a considerable amount of time. Previous attempts to satisfy this need were often deficient in both critical performance requirements and cost. Because regulatory changes are not driving this technology at present, adhesive manufacturers are reluctant to introduce products based on expensive raw materials. Thus, branched polyesters represents a "best of both worlds" compromise where water-dispersibility is provided, along with other unique attributes, without sacrificing the key application/performance profiles that the adhesive industry requires.

Eastman has developed branched water-dispersible polyester which, in addition to aqueous dispersions, may be used in the formulation of hot-melt adhesives for packaging, nonwovens, and other uses. Available in a range of viscosities (IVs), this material offers the following key features:

- 100% water-dispersible in ordinary tap water.
- Non-dispersible in ionic solutions
- Superior adhesion to Polyolefin films.
-

Comparable key physical properties

Introduction

Hot-melt adhesives are useful for bonding various substrates such as wood, paper, plastics, nonwoven assemblies, textiles, and other materials. These applications call for high bond strength to resist shock, stress, high humidity, and extreme temperatures encountered in transportation and storage. In addition, the melt point, wetting time, initial tack, setting time, pot life, and general handling characteristics on automatic machinery are essential considerations. The hot melt industry has desired a water dispersible raw material for a considerable amount of time. In response to this need Eastman developed a family of water dispersible sulfopolyesters for use in hot melt and aqueous repulpable formulations. The properties and performance characteristics of these water dispersible polyesters will be described in this paper. Although these water dispersible raw materials were developed for use in packaging adhesives, the unique combination of properties renders these polymers suitable for non-woven applications.

Table 1

Physical Properties				
Production Status	Commercial	Commercial	Commercial	Commercial
Product Name	AQ 1045	AQ 1350	AQ 1950	AQ 14000
Brookfield Thermosel viscosity @ 177°C, cP (mPa·s)	3000-6000	28,000-45,000	80,000-110,000	300,000-500,000
Gardner colors (molten), max.	4	4	4	4
Physical form	Clear Solid	Clear Solid	Clear Solid	Clear Solid
Ring & ball softening point, °C (ASTM E 28)	80-90	100-110	110-120	125-140
Penetration hardness, dmm (ASTM D 5)	30	14	8	7
Tg (DSC), °C (ASTM D 3418)	-5	-2	3	7
Tensile strength, Mpa (ASTM D 412)	-	0.27	0.38	0.61
Elongation, %	1660	1600	1400	1200
Hydroxyl number	28	28	28	28
a Based on preliminary testing				
b Brookfield Thermosel Viscosity RVDV1+, 10 g of each sample conditioned at 90°C for 16 h in a vacuum oven prior to testing				

Table 2

Adhesive Performance of Branched Polyesters:*

Treated Substrate	Polyethylene	PET
AQ1045	50 g/mm	35 g/mm
AQ1350	87 g/mm	114 g/mm
AQ1950	97 g/mm	109 g/mm
AQ14000	68 g/mm	37 g/mm
* Heat sealed T-peel assemblies, ASTM D1876		

Technical Aspects of Polyesters

Eastman conventional water-dispersible polyesters are linear, amorphous materials comprised of aromatic acids and aliphatic glycols. Available in both pellet and dispersion form, they range in glass transition temperature (Tg) from 29° to 55°C.

Their water-dispersibility is due to the presence of pendent sodiosulfo groups randomly distributed along the polymer backbone. Incorporation of the ionic moieties is readily accomplished by copolymerization of 5-sodiosulfoisophthalate units into the polymer backbone. A = an aromatic dicarboxylic acid moiety G = an aliphatic or cycloaliphatic glycol residue OH = hydroxy end groups.

Figure 1

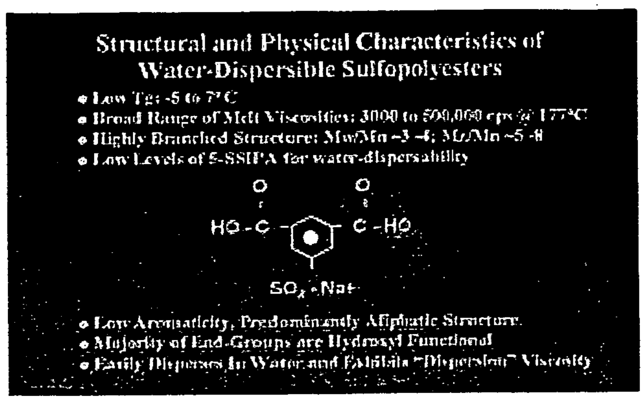
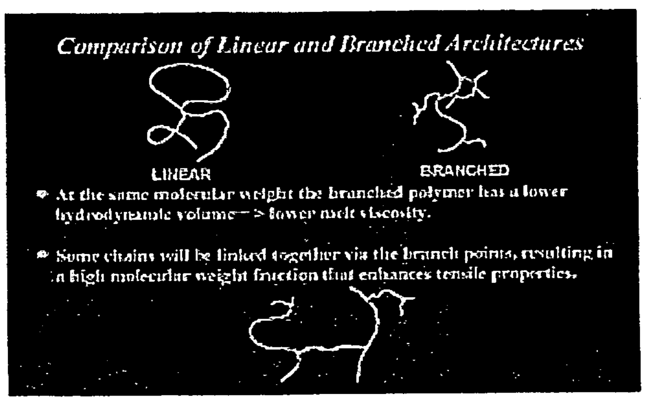


Figure 2



The following discussion covers the key differences in structure and properties between the branched polyester and conventional water-dispersible polyesters.

The unique properties of the new polyester are derived from a branched architecture and a specific combination of monomers resulting in a low Tg and enhanced compatibility with other resins. The low Tg provides, in part, the means by which water-dispersibility is readily obtained at or below room temperature, while the conventional water-dispersible polyesters are much more difficult to disperse.

The branched structure of the polyester results in low melt viscosity profiles that are required for hot-melt adhesive formulations. Potentially available in IV ranging from 0.2 to 0.65, the branched polyester exhibits melt viscosities ranging from 3000 cP to 400,000 cP at 177¢ C; a 0.3 IV branched polyester typically exhibits a viscosity of approximately 35,000 cP at 177¢ C. By comparison, the conventional water-dispersible polyester with a nominal IV of 0.3 will exhibit a melt viscosity of about 300,000 cP at 280¢ C, or over 1 million cP at 177¢ C. Since both types of material have the same IV, one might expect them to have the same molecular weight. However, their true molecular weights differ since branching most likely lowers the radius of gyration and thus decreases the hydrodynamic volume. Another aspect of molecular weight relates to distribution of chain lengths. It is likely that the low viscosity/good adhesive profile of the branched polyester results from a broader molecular weight distribution. On the one hand, there are large quantities of low molecular weight species to provide the

lower melt viscosities, but there are also more of the very high molecular weight species that are most likely yielding the good adhesion and satisfactory tensile properties. This is quantitatively illustrated by the molecular weight distributions (MWD) that were obtained from GPC analysis using PET standards; a linear analog of similar composition showed a polydispersity (Mw/Mn) of 2.3, while the branched polyester samples were in the 3.5 -4 ranges. An even more striking emphasis of this point is gained when the very high molecular weight fractions, known as Mz or the z-average molecular weight, are compared to Mn. As before, GPC analysis was used to obtain the data. For the linear and branched materials, Mz/Mn values of 4.8 and 9 - 10 were obtained, respectively. It is generally known that a high Mz/Mn is indicative of a branched material. A summary of the molecular weight distribution data is found in Table 2.

Table 3

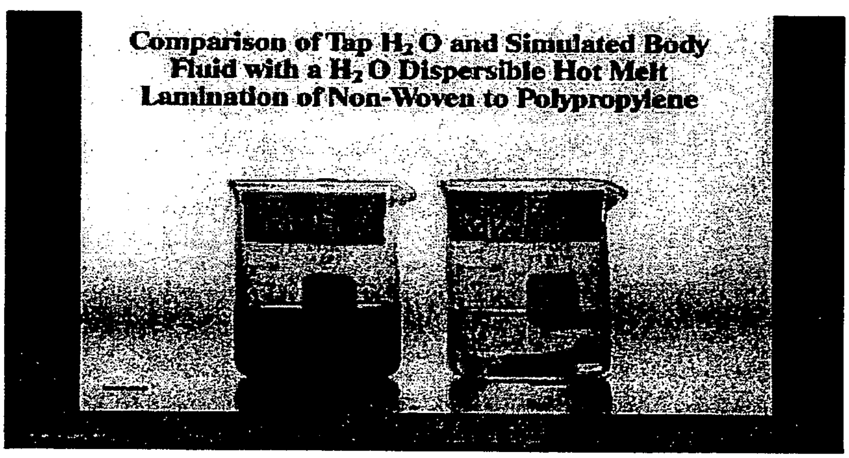
Comparison of molecular weight distribution data

Architecture	Mw/Mn	Mz/Mn
Linear	2.3	4.8
Branched	* 3.5 – 4	9 – 10

* Data is a range taken from several sample runs

Product function: These products are inherently water-dispersible due to the random incorporation of 5-sodiosulfoisophthalate units within the polyester backbone. The compatibility with a range of commonly employed hydrophobic raw materials, such as acid functional and /or aromatic or cyclic structure tackifying resins, glycol-containing oils, or cyclo aliphatic plasticizer, allows for a variety of hot-melt adhesives to be formulated. These finished adhesives are then rendered water-dispersible by the efficacy of the branched polyester as a surfactant. The recyclability or flushability of

Figure 3



non-woven adhesively bonded articles are enhanced; for example, a disposable diaper in a waste treatment environment process is not affected by the presence of insoluble masses of adhesive. The uniqueness of this branched polyester stems from its tailored molecular architecture. A proprietary process has allowed a highly branched structure to be manufactured within narrow ranges of melt viscosities. This results in a broad molecular weight distribution where there are enough low molecular weight fractions to provide the low melt viscosities, while at the other end of the spectrum there are sufficient numbers of high molecular weight species to give the tensile and adhesive properties that are needed. Another key breakthrough was the discover of a monomer composition that did not just lower the glass transition (Tg) to alleviate the brittleness problem, but also provided a high ring and ball softening point. Finally, the same ionic nature of this branched polyester that results in water-dispersibility also prevents solubility in ion-containing body fluids.

Principal applications

This product is being targeted toward large volume applications, where we have found indications of broad utility.

Non-woven product assemblies

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A variety of disposable products, such as diapers, sanitary napkins, and incontinent briefs would be more environmentally friendly if a water-dispersible hot-melt adhesive could be used. For example, a branched polyester (0.31V) quickly dissolves into a compost pile; this would facilitate the breakup of a diaper assembly and hasten the degradation by virtue of the more rapid increase in surface area. Another example could be the design of a "flushable" sanitary napkin. Once again, the assembly would undergo fragmentation more rapidly, which, in turn, would hasten degradation. It would be an understatement to say that the non-dispersibility of branched polyesters in body fluids (urine, sweat) is an essential innovation characteristic to spur these types of product developments.

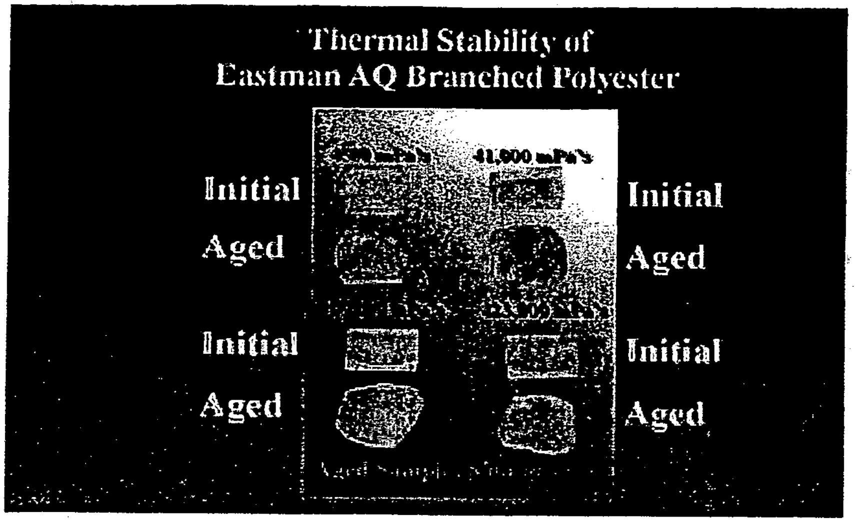
Explanation for dispersibility on sulfopolyesters in tap water and non-dispersibility in body fluid. The sudiosulfo groups introduce charged functionalities that electrostatically stabilize the polymer molecule in pure water. The remainder of the sulfopolyester, although relatively polar, is not inherently water-soluble. Because the ionic groups are randomly distributed along the backbone, it is unlikely that a classical micelle structure is formed where all the charged groups reside on the surface of a particle with the hydrophobic segments occupying the inferior. Sulfopolyesters are not known to form true solutions, but rather exist as dispersions of particles in water. Therefore, it is reasonable to expect that the surface of the particles would contain a greater proportion of the ionic groups to provide water dispersibility. The discrete particle phase is a key to the non-dispersibility in saline solutions, because adding salt to the water in essence causes the water to become a poorer solvent for the sulfopolyester. Adding ionic species to the water will invoke a situation of electrostatic repulsion where the polymer particles will have no driving force to form dispersion. Viewing this situation from the opposite perspective where the polymer would be already dispersed and salt then added to the aqueous medium, it would be possible to precipitate out the polymer. Thus, ionic strength may be used as tunable solubility mechanism for recovery of the dispersed polymer. Increasing the ionic strength of the aqueous medium to a high enough level will cause the polymer particles to overcome their repulsion, coagulate, and form a separate phase.

Incorporation into Adhesive Formulations

This unique branched polyester can be combined with a wide range of other commonly used adhesive raw materials. The tackifying resins useful in adhesive compositions are generally polar in nature and have a Ring and Ball Softening Point greater than 80¢ C. Water-dispersibility and compatibility with a variety of tackifying resins/rosins were evaluated. Results indicate excellent compatibility with resins/rosins with aromatic, cycloalphatic, or highly acid functional chemical structures. Various plasticizing or extending oils may be incorporated into the base polyester. Compatible plasticizer includes white mineral oils and benzoate plasticizer, such as dipropylene glycol dibenzoateand 1,4-Cyclohexane dimethanol dibenzoate.

Among the applicable stabilizers or antioxidants that may be used are high molecular weight hindered phenols and multifunctional phenols such as sulfur and those containing phosphorous. The water-dispersible branched polyester is manufactured with both primary and secondary antioxidants.

Figure 4



Thermal Stability of Eastman Branched Polyester

The following tables demonstrate the formulation versatilely with these sulfopolyesters, in a variety of end use applications.

Table 6

Nonwoven Adhesive

AQ1350	60%
Plasticizer	5%
Rosin Ester	35%
Viscosity @ 275F	19,350cp
Viscosity @ 285F	12,700cp
Viscosity @ 300F	8012cp
RBSP°C	87
PE to PE Adhesion	42g/mm

Table 7

Pressure Sensitive Adhesive

AQ14000	60%
Rosin Ester	20%
Plasticizer	20%
Viscosity	4000 cps
RBSP	78° C
90° Quick Tack	140 g/mm
180° Peel Adhesion	80 g/mm
RT Hold Power	22 hrs

Results and Conclusions:

The results of this study indicated that the water dispersible polyesters should find considerable utility in a wide variety of recyclable aqueous and hot melt adhesive applications. Preliminary formulations have been identified for nonwoven assemblies, and pressure sensitive applications. In each of these areas, the water dispersible polyesters provide for a unique combination of performance including water dispersibility in neutral or alkaline conditions yet not dispersible in ionic solutions such as body fluids.

References

Optimization of Hot Melt Adhesives Using Water Dispersible Polyesters, Richard A Miller and Gregg. Althen, Proceedings of the TAPPI Hot Melt Adhesive Seminar 1996.

Eastman AQ Branched Polyester a New Water-Dispersible Adhesive Raw Material, Richard A Miller and Dr.Scott George, the Journal of the Adhesive and Sealant Council, Inc., Vol.XXVI, No.1, 1195.

Miller et al. US 5,543,488 Water Dispersible Adhesive Composition and Process